

" Summary "

Capital structure (long term sources of fund)

Debt

Equity

Bond

Preferred

Common

New issuance

* Cost of debt

I : Interest

Nd : Net Debt

After tax cost of

* Cost of preferred equity (r_p)

Dp : Dividend

Np : Net Proceeds

* Cost of Common equity (r_s) :

Cost of retained earnings

$$r_r = \frac{D_1}{P_0} + g$$

D_1 : the dividends for the next year

$$D_1 = D_0 (1 + g)$$

g : The constant growth rate

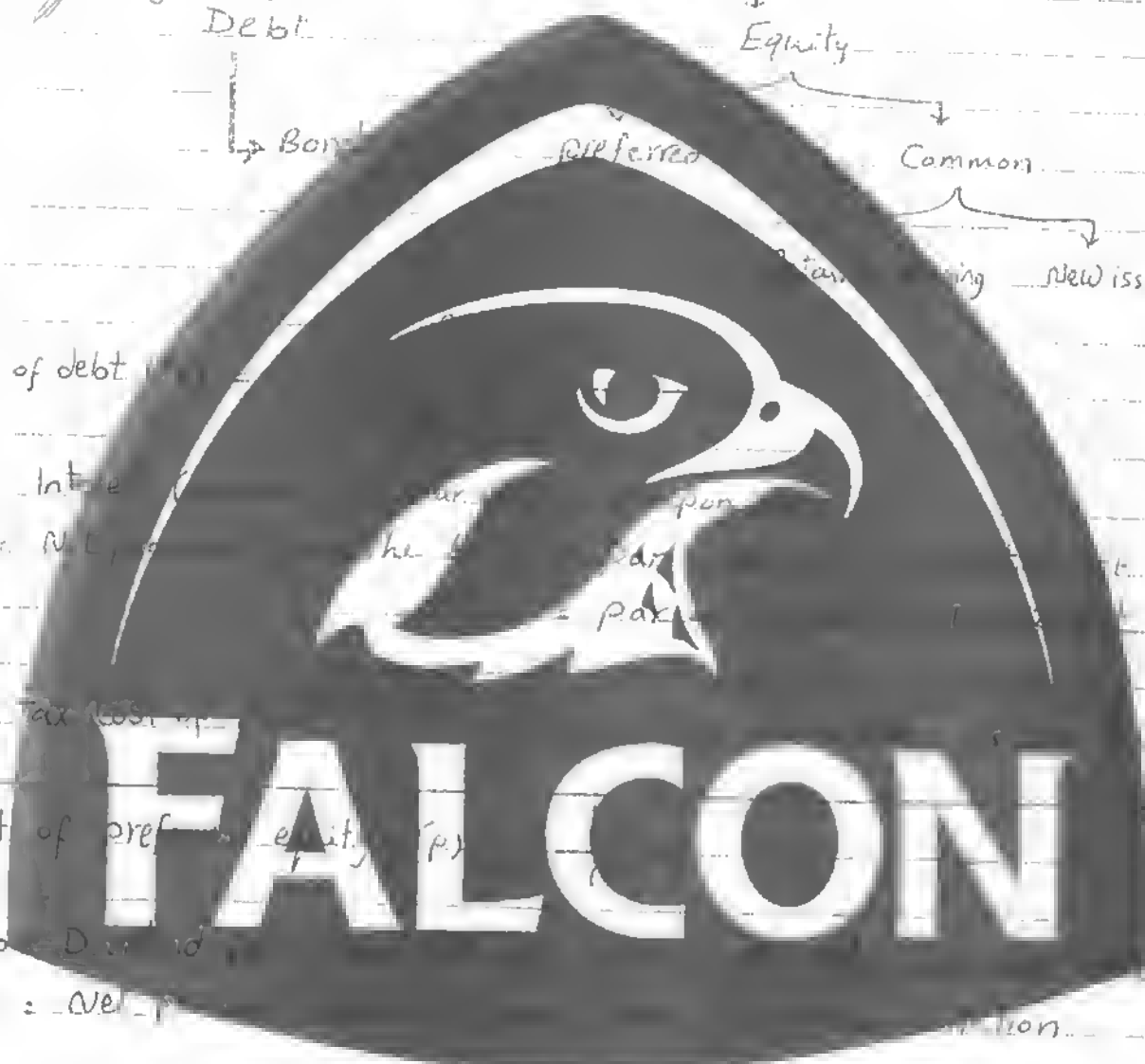
P_0 : is the current market price

Cost of new issuance

$$r_n = \frac{D_1}{N_n} + g$$

N_n : The net proceeds from the sale of new stocks

$N_n = \text{price} - \text{underpricing} - \text{flotation}$



(2)

Also, we can calculate the Cost of retained earnings using CAPM:

$$r_r = R_F + b(r_m - R_F)$$

* Weighted Average Cost of Capital: (After tax Cost of Capital)

$$WACC = W_i r_i + W_p r_p + W_s r_s$$

W_i : weight of debt in the Capital Structure Debt

W_p : " " preferred equity Capital

W_s : " " common equity Capital

problem (1)

Currently, the company is selling 15-year bonds with a face value of \$1000. The bonds are paying an annual interest rate of 12.25%, and the bond is currently selling at a price of \$980. The company is in the process of issuing the bonds, and the 40% tax bracket will be applied to the interest payments.

Solution:

$$Y_d = \frac{I + \frac{\text{Par} - N_d}{n}}{\frac{N_d + \text{Par}}{2}} = \frac{120 + \frac{1000 - 980}{15}}{\frac{980 + 1000}{2}} = 12.25\%$$

$$\begin{aligned} \text{After tax Cost of debt } r_i &= Y_d(1-T) = 12.25\%(1-40\%) \\ &= 7.35\% \end{aligned}$$

(3)

problem (2)

A corporation asked its financial manager to calculate its weighted average cost of capital given the following data :

- The firm can sell for \$980 a 10-year, \$1,000-par value bond paying annual interest at a 10% coupon rate. A flotation cost of 3 % of the par value is required in addition to the discount of \$20 per bond.
- Eight percent (annual dividend) preferred stock having a par value of \$100 can be sold for \$65. A flotation cost of \$2 per share must be paid to the underwriters.
- The firm's investment banker and its own analysts estimate that the risk free rate equals 7%, the firm's beta is 1.5, and the market return equals 11%.
- The tax rate is 35%.
- The proportion of common stock is 50%.
- The proportion of preferred stock is 10%.

Solution (2)

• Bond :

Y_d

After tax cost of debt

• preferred stock

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$$\text{Cost of preferred stock } r_p = \frac{D_p}{N_p} = \frac{8}{63} = \underline{\underline{12.69\%}}$$

• Common Stock : $R_F = 7\%$ $b = 1.5$ $r_m = 11\%$

$$\begin{aligned} \text{Cost of retained earnings } r_r &= R_F + b(r_m - R_F) \\ &= 7\% + 1.5(11\% - 7\%) = \underline{\underline{13\%}} \end{aligned}$$

$$\begin{aligned} \text{WACC} &= W_d r_d + W_p r_p + W_s r_r \\ &= (40\% \times 6.45) + (10\% \times 12.69\%) + (50\% \times 13\%) = \underline{\underline{10.349\%}} \end{aligned}$$

(4)

Problem (3):

A company has a capital structure consists of 30% debt, 20% preferred equity, and 50% common equity. The following data are collected about this company:

Debt: The firm can sell \$1000 Par, 8% Coupon rate, 20 year bonds at \$30 discount per bond. The firm must also pay flotation costs of \$30 per bond.

preferred stock: The firm can sell 8% preferred stock at its \$95 per share par value. The cost of issuing preferred stock is \$5 per share.

Common stock: The firm can sell common stock for \$90 per share. The firm's dividend next year is \$7 per share. The firm's dividend growth rate is 6%. The stock has flotation costs are \$5 per share.

→ Assume the firm is a corporation.

Solution (s):

Cost of debt

After tax cost of debt $r_d = 8\% \times (1 - 0.3) = 5.6\%$

Cost of preferred

Cost of Common stock $r_s = \frac{D_1}{P_0 - F} + g = \frac{7}{(90 - 5)} + 6\% = 15\%$

WACC = $w_d r_d + w_p r_p + w_s r_s$

$= (30\% \times 5.6\%) + (20\% \times 8.4\%) + (50\% \times 15\%) = 10.71\%$

(5)

problem (4) :

Assume that :

1. The target weights for the financial structure are 0.40 long term debt, 0.10 preferred stock and 0.50 Common Stock equity.
2. The cost of long term debt after tax is 5.6 %.
3. The cost of preferred stock is 10.6 %.
4. The market price of Common Stock is \$50 per share.
5. The expected dividend on stock is \$4 per share.
6. The expected growth rate is 5%.
7. The total under retained earnings are \$10.

Required

- (a) what is the WACC?
- (b) what is the marginal cost of capital if the expected retained earnings are \$10?

$$W_i =$$

$$r_i = 5\%$$

$$r_r =$$

$$r_n =$$

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→ WACC using

$$= W_i r_i + W_p r_p + W_s r_r$$
$$= (.40 \times 5.6\%) + (.10 \times 10.6\%) + (.50 \times 13\%) = 9.8\%$$

as the amount of expected retained earnings = \$30,000 only, the amount of total capital structure using retained earnings = $\frac{30,000}{50\%} = \$60,000$

→ If the capital structure is greater than \$60,000, the marginal

$$\text{Cost of Capital} = W_i r_i + W_p r_p + W_s r_n$$

$$= (.40 \times 5.6\%) + (.10 \times 10.6\%) + (.50 \times 15\%) = 10.8\%$$

(6)

Replacement

3 types of cash flows related to the replacement decision:

1- **Initial investment** = Installed cost of new asset + Change in net working capital - After-tax proceeds from sale of old asset.

- Installed cost of new asset = total Cost of new asset + shipping + installation + insurance
- Change in net working capital = change in current assets - change in current liabilities ($\Delta NWC = \Delta CA - \Delta CL$)
- After-tax proceeds from sale of old asset = Proceeds from sale of old asset + or - Tax on sale of old asset

2- **Incremental operating cash flows**

($\Delta \text{Revenue} - \Delta \text{Expense} - \Delta \text{Depreciation} + \Delta \text{Interest} + \Delta \text{Change in working capital}$)

= $\Delta \text{EBIT} (1 - T) + \Delta \text{Interest} + \Delta \text{Change in working capital}$

= $\Delta \text{NOPAT} + \Delta \text{Interest} + \Delta \text{Change in working capital}$

= $\Delta \text{EBDIT} (1 - T) + \Delta \text{Interest} + \Delta \text{Change in working capital}$

3- **Terminal cash flow**

= Change in net working capital + After-tax proceeds from sale of old asset

- Change in net working capital = Change in current assets - Change in current liabilities
- After-tax proceeds from sale of old asset = Proceeds from sale of old asset + or - Tax on sale of old asset

Note

the replacement

Problem The electric company is to replace an existing machine with a new machine. The new machine is more efficient piece of equipment. The existing machine is 5 years old and cost \$32,000 and is being depreciated under MACRS. The new machine costs \$40,000 to purchase and install. The company is using a 5-year recovery period.

Purchase of the new machine would result in a \$4,000 increase in net working capital.

Earnings before depreciation, interest, and taxes with the new machine are \$21,000 annually; With existing machine are \$14,000 annually.

The existing machine can currently be sold for \$18,000 and will not incur any removal or cleanup costs. At the end of 5 years, it can be sold to net \$1,000 before taxes. The new machine can be sold to net \$12,000 before taxes at the end of the 5-year period. The firm is subject to a 40% tax rate.

- Calculate the *initial investment* associated with the new machine.
- Calculate the *incremental operating cash inflows* associated with the new machine.
- Calculate the *terminal cash flow* at the end of year 5.
- Assume 10% discount rate, would the company replace the existing machine or not?

(7)

Solution (5):

Existing (old) machine

new machine

3-year old, Cost \$ 32 000

T. Cost = 40 000 + 8 000 = 48 000

MACRS 5-year

Life 5 years MACRS 5-year

Remaining life 5 years

Δ NWC = 4 000

EBDIT = \$14 000 annually

EBDIT = 21 000 annually

Sale price today

Sale price after 5-years = \$ 12 000

Sale price after 3 years = \$ 10 000

40%

(a) 1. Book value of old

Accumulated depreciation

2.

3.

9 280

2. G

48 000 - 9 280 = 38 720

3. T

4. A

512

→ I_0

machine

old machine

(b)

on

machine

Δ
new - old

96

5760

1520

3.

x 1

1000 x 5

520

4.

x 12

1000 x 12

760

5.

x 21

1000 x 21

760

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Year (1)

Year (2) = (21 000 - 14 000) x (1 - 40%) + 7520 x 40% = 7808

Year (3) = (21 000 - 14 000) x (1 - 40%) + 7520 x 40% = 7208

Year (4) = (21 000 - 14 000) x (1 - 40%) + 5760 x 40% = 6504

Year (5) = (21 000 - 14 000) x (1 - 40%) + 5760 x 40% = 6504

(8)

(c) 1. B.V of new machine = $48000 - [48000 \times (20\% + 32\% + 19\% + 12\% + 12\%)]$
 = \$ 2400

2. Gain (Recaptured dep.) = $12000 - 2400 = 9600$

3. Tax liability = $9600 \times 40\% = 3840$

4. After Tax proceeds from machine = $12000 - 3840 = \$ 8160$

1. B.V of old machine = Zero (fully depreciated)

2. Gain (Recaptured dep.) = $12000 - 0 = 12000$

3. Tax liability = $12000 \times 40\% = 4800$

4. After Tax proceeds from machine = $12000 - 4800 = \$ 7200$

→ Terminal value

= After Tax proceeds from machine = \$ 8160

= After Tax proceeds from machine = \$ 7200

(d)

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So, the Company is buying machine

(9)

Problem (6) Russell Industries is considering replacing a fully depreciated machine that has a remaining useful life of 10 years with a newer, more sophisticated machine. The new machine will cost \$200,000 and will require \$30,000 in installation costs. It will be depreciated under MACRS using a 5-year recovery period. A \$25,000 increase in net working capital will be required to support the new machine. The firm's managers plan to evaluate the potential replacement over a 4-year period. They estimate that the old machine could be sold at the end of 4 years to net \$15,000 before taxes; the new machine at the end of 4 years will be worth \$75,000 before taxes. Calculate the *terminal cash flow* at the end of year 4 that is relevant to the decision to purchase the new machine. The firm is subject to a 40% tax rate.

Solution (6)

• B.V. of new machine = Cost of machine - [Depreciation (20% + 32% + 19% + 12%)]

• Recaptured depreciation = \$0

• Tax liability = \$0

• After-tax cash flow = \$15,000 - \$0 = \$15,000

→ Book value of the machine = \$0

• Recaptured depreciation = \$0

• Tax liability = \$0

• After-tax cash flow = \$15,000

→ Terminal cash flow = After-tax cash flow + After-tax salvage value of old machine

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(10)

" Capital Budgeting "

Economic value Added: (EVA)

Example: Suppose a certain project costs \$1,000,000 up front, but after that it will generate net cash inflows each year (in perpetuity) of \$120,000. To calculate the NPV of this project, we would simply discount the cash flows and add them up. If the firm's cost of capital is 10%, then the project's NPV is: $NPV = -\$1,000,000 + (\$120,000 \div 0.10) = \$200,000$

EVA = project cash flow - [(cost of capital) * (invested capital)]

$= \$120,000 - (.10 * 1,000,000) = \$120,000 - \$100,000 = \$20,000$

The project produces an annual EVA of \$20,000 in perpetuity.

Discounting this at 10% gives a project EVA of \$200,000 ($\$20,000 \div .10$), identical to the NPV.

Problem (9): A project costs \$2,000,000 up front and generate cash flows in perpetuity of \$240,000. The firm's cost of capital is 9%.

- Calculate the project's NPV.
- Calculate the annual EVA of the project.
- Calculate the overall EVA of the project.

Problem (10): A firm is considering a project that costs \$1,000,000 up front and generates an annual cash flow of \$120,000 per year. The firm's cost of capital is 10%.

- Determine the NPV of the project.
- Determine the annual EVA of the project.
- Determine the overall EVA of the project.

Problem (11): A firm is considering a project that costs \$10,000 up front and generates an annual cash flow of \$1,500 per year. The firm's cost of capital is 10%.

- Determine the NPV of the project.
- Assuming that the cash inflows continue to \$1,500 per year for 10 years, how many years would the project have to generate cash inflows to make it have an IRR of 10%?
- With the cash inflows of \$1,500 per year, what annual cash inflow that the project would have to generate to make it have an IRR of 10%?

Problem (12): Benson Designs has prepared the following estimates for a long term project it is considering. The initial investment is \$18,250, and the project is expected to yield after-tax cash inflows of \$4,000 per year for 7 years. The firm has a 10% cost of capital.

- Determine the *net present value (NPV)* for the project.
- Determine the *internal rate of return (IRR)* for the project.
- Would you recommend that the firm accept or reject the project?

(11)

Solution (9) : $C F_0 = 2.5 \text{ m.}$ Annual $C F = 240,000$ Perpetuity

a) $NPV = \frac{C F}{r} - C F_0 = \frac{240,000}{9\%} - 2.5 \text{ m.} = 2,666,666.67 - 2.5 \text{ m.} = 166,667$

b) Annual EVA = project $C F - (\text{Cost of Capital} \times \text{Invested Capital})$
 $= 240,000 - (9\% \times 2.5 \text{ m.}) = \$15,000$

c) The overall project EVA = $EVA \div r$ ← Perpetuity is
 $= 15,000 \div 9\% = 1,666,667$

We find that the

Solution (10) :

a) $NPV = 4,000$ (Reject)

b) We have order to

→

→

→

248.4

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if RRR is greater than 8.87% reject the Asset.

So, the Maximum acceptable RRR is 8.87%.

Since the firm's Cost of Capital (RRR) is 10% which is greater than 8.87%, the project is rejected.

(12)

Solution (11) :

0 1 2 ... 10
(61450) 10000 ... 10000

a) Assume $r = 10\% \rightarrow NPV = 10000 \times PVIFA_{10\%, 10} - 61450 = \text{Zero}$
So, $IRR = 10\%$

$\therefore IRR (10\%) < \text{Cost of Capital } (15\%)$ So, we reject the project

b) قالو

c) $CF \times PVIFA_{15\%, 10}$

$CF \times 5.0188 = 450 \times 5.0188 = 2258.4$

Solution (12) :

a) $NPV = 4$

b) Assume
Assume

$r = 10\%$

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15%

$IRR = 10\% + \frac{1223.6}{1223.6 + 1608.4} (15\% - 10\%) = 12.16\%$

c) The firm should accept because $NPV > 0$ and $IRR > RRR$

*** wait for part (2) ***

(13)

problem (13):

Capital Budgeting

A and B are mutual exclusive of equal risk. The firm's cost of capital is 13%. The cash flows for each project are shown in the following table.

| | Project A | Project B |
|--------------------|--------------|-----------|
| Initial investment | \$80000 | \$50000 |
| year | Cash inflows | |
| 1 | 15000 | 15000 |
| 2 | 20000 | 15000 |
| 3 | 25000 | 15000 |
| 4 | 30000 | 15000 |
| 5 | 35000 | 15000 |

- Calculate the NPV for each project.
- Calculate the IRR for each project.
- Assume that the cost of capital is 16%. Which project would you recommend. Explain why.

$$PVIFA_{13\%,5} = 3.352$$

$$PVIFA_{16\%,5} = 3.274$$

Solution

$$(a) \quad NPV_A \text{ at } 13\% = \left[\frac{15000}{(1+13\%)^1} + \frac{20000}{(1+13\%)^2} + \frac{25000}{(1+13\%)^3} + \frac{30000}{(1+13\%)^4} + \frac{35000}{(1+13\%)^5} \right] - 80000 = \$3655$$

$$NPV_B \text{ at } 13\% = (15000 \times PVIFA_{13\%,5}) - 50000 = \$2716$$

According to NPV, project A is preferred with higher NPV.

(b) To find IRR for A:

• Assume $r = 13\% \rightarrow NPV_A \text{ at } 13\% = 83655 - 80000 = 3655$

• Assume $r = 16\% \rightarrow NPV_A \text{ at } 16\% =$

$$\left[\frac{15000}{(1+16\%)^1} + \frac{20000}{(1+16\%)^2} + \frac{25000}{(1+16\%)^3} + \frac{30000}{(1+16\%)^4} + \frac{35000}{(1+16\%)^5} \right] - 80000$$

$$= 77043 - 80000 = -2957$$

(14)

| r | PV | + NPV |
|-----|-------|-------|
| 13% | 83655 | 83655 |
| 16% | 77043 | 80000 |
| 3% | 6612 | 3655 |

$$IRR_A = 13\% + \frac{3655}{6612} \times 3\% = 14.6\%$$

To Find IRR for B :

• Assume $r = 15\%$

$$NPV_B \text{ at } 15\% = (15000 \times PVIFA_{15\%,5}) - 50000$$

$$= 50280 - 50000 = 280$$

• Assume $r = 16\%$

$$NPV_B \text{ at } 16\% = (15000 \times PVIFA_{16\%,5}) - 50000$$

$$= 49110 - 50000 = -890$$

| r | PV | NPV |
|-----|-------|-------|
| 15% | 50280 | 50280 |
| 16% | 49110 | 50000 |
| 1% | 1170 | 280 |

$$IRR_B = 15\% + \frac{280}{1170} \times 1\% = 15.2\%$$

→ According to IRR, project (B) is preferred with higher IRR.

(c) If Cost of Capital above 14% :

$$NPV_A \text{ at } 14\% = 1361.8$$

$$IRR_A = 14.6\%$$

$$NPV_B \text{ at } 14\% = 1495 \quad \checkmark$$

$$IRR_B = 15.2\% \quad \checkmark$$

In this Case, our decision will change. We have to select project (B) with higher NPV and higher IRR.

(15)

* Assume in the previous problem, you are required to draw the NPV profiles for both projects on the same set of axes and discuss any conflict in ranking that may exist between NPV and IRR.



At 13% Cost of Capital (before cross-over rate):

A Conflict exist between NPV and IRR. According to NPV we have to select (A) with higher NPV. According to IRR we have to select (B) with higher IRR.

In this case, we will select project (A) as recommended by NPV because:

1. our objective is to maximize shareholder wealth, which will be achieved through maximizing the value not the rate.
2. NPV assumes that intermediate cash flows are reinvested at Cost of Capital, while IRR assumes it is reinvested at the project IRR. The more realistic is Cost of Capital assumed by NPV.

So, NPV is preferred over IRR in ranking mutual exclusive projects.

Above 14% Cost of Capital (after cross-over rate):

No Conflict exist. Select (B) According to NPV and IRR.

Note 3 reasons of the Conflict between NPV and IRR:

1. Different reinvestment rate assumptions.
2. Timing of CFs
3. Magnitude (size) of initial investment.

(16)

" Risk & Refinement in Capital Budgeting "

problem (14) : Assuming the following info. about two projects A and B :

| | project (A) | project (B) |
|--------------------|-------------|-------------|
| Initial investment | 100 000 | 150 000 |
| Life | 5 years | 5 years |
| Annual Cash flows | 20 000 | 50 000 |
| Beta | 1 | 1.5 |

→ Market rate of return is 10% and risk free is 6% .

Calculate NPV for each project , and explain the underlying Concept .

$$PVIFA_{10\%, 5} = 3.791$$

$$PVIFA_{12\%, 5} = 3.605$$

Solution

projects A and B have different betas which mean that they have different risk . So, They have different risk-adjusted discount rates (RADR) .

$$\begin{aligned} RADR(A) &= R_f + b(R_m - R_f) \\ &= 6\% + 1(10\% - 6\%) = 10\% \end{aligned}$$

$$RADR(B) = 6\% + 1.5(10\% - 6\%) = 12\%$$

$$NPV(A) = (20\,000 \times PVIFA_{10\%, 5}) - 100\,000 = -24\,180 \times$$

$$NPV(B) = (50\,000 \times PVIFA_{12\%, 5}) - 150\,000 = 30\,250 \checkmark$$

→ Differences in risk should be Considered when evaluating projects by adjusting discount rate used in calculating NPV .

(17)

problem (15):

also

A firm is considering the purchase of one of three mutually exclusive projects for increasing production efficiency. The firm plans to use a 14% cost of capital to evaluate these equal-risk projects. The initial investment and annual cash inflows over the life of each project are shown in the following table.

| | Project X | Project Y | Project Z |
|---------------------------------------|---------------------------------|-----------|-----------|
| Initial investment (CF ₀) | \$78,000 | \$52,000 | \$66,000 |
| Year (t) | Cash inflows (CF _t) | | |
| 1 | \$17,000 | \$28,000 | \$15,000 |
| 2 | 25,000 | 38,000 | 5,000 |
| 3 | 31,000 | | 15,000 |
| 4 | 41,000 | | 15,000 |
| 5 | | | 15,000 |
| 6 | | | 15,000 |
| 7 | | | 15,000 |

- Calculate the NPV for each project over its life. Rank the projects in ascending order on the basis of NPV.
- b. Use the annualized net present value (ANPV) approach to evaluate and rank the projects in descending order on the basis of ANPV.
- c. Compare and contrast your findings in parts a and b. Which project would you recommend that the firm invest in?

Relevant

$$F_{14\%,4} = 1.914$$

$$F_{14\%,5} = 1.647$$

$$F_{14\%,8} = 4.639$$

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Solution

$$(a) \quad NPV_x = \left[\frac{17000}{(1.14)^1} + \frac{25000}{(1.14)^2} + \frac{33000}{(1.14)^3} + \frac{41000}{(1.14)^4} \right] - 78000$$

$$= \underline{2698}$$

$$NPV_y = \left[\frac{28000}{(1.14)^1} + \frac{38000}{(1.14)^2} \right] - 52000 = \underline{1801}$$

$$NPV_z = (15000 \times PVIFA_{14\%,8}) - 66000 = \underline{3585}$$

(18)

In descending order :

| | | | |
|-------|------|---------|------------|
| NPV y | 1801 | 2 years | |
| NPV x | 2698 | 4 years | |
| NPV z | 3585 | 8 years | (The best) |

on the basis of NPV, project z is preferred with the highest NPV.

$$(b) ANPV_x = \frac{2698}{PVIFA_{14\%,4}} = 926$$

$$ANPV_y = 1801 \div PVIFA_{14\%,2} = 1094$$

$$ANPV_z = 3585 \div PVIFA_{14\%,8} = 773$$

In descending order :

| | | | |
|--------|------|---------|------------|
| ANPV z | 773 | 8 years | |
| ANPV x | 926 | 4 years | |
| ANPV y | 1094 | 2 years | (The best) |

on the basis of ANPV, project y is preferred with the highest ANPV.

(c) According to NPV, project z is preferred
" " ANPV, " y is preferred

In case of evaluating projects with unequal lives, NPV is not appropriate technique.

The appropriate criterion used in evaluating projects with unequal lives is ANPV.

So, we have to select project (y) with the highest ANPV.

Ch(13) Leverage

Income statement

Sales

 $Q \times P$ Less: Variable Cost - ($Q \times V_c$)Less: Fixed Cost (F_c)Operating Leverage
(DOL)EBIT = $Q(P - V_c) - F_c$ Less: Interest (I)

Earning before Tax

Less: Tax (T)Financial Leverage
(DFL)

Net profit after Tax

Less: preferred dividends (PD)

Earning available for Common

 \div number of shares

Total Leverage (DTL)

EPS

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$$DOL = \frac{\% \Delta EBIT}{\% \Delta Sales}$$

$$= \frac{Q(P - V_c)}{Q(P - V_c) - F_c}$$

$$DFL = \frac{\% \Delta EPS}{\% \Delta EBIT}$$

$$= \frac{Q(P - V_c) - F_c}{Q(P - V_c) - F_c - I - \left(\frac{PD}{1-T}\right)}$$

$$= \frac{EBIT}{EBIT - I - \left(\frac{PD}{1-T}\right)}$$

$$DTL = \frac{\% \Delta EPS}{\% \Delta Sales} = DOL \times DFL$$

$$= \frac{Q(P - V_c)}{Q(P - V_c) - F_c - I - \left(\frac{PD}{1-T}\right)}$$

Break even

$$= \frac{F_c}{P - V_c}$$

(20)

problem (16) : A company is currently selling 30 000 units at \$6 per unit. Variable Cost per unit = \$3.5. Fixed operating Costs = \$50 000 per year. Interest = \$13 000. preferred dividends = \$7 000. Tax rate = 40%

- (a) Calculate operating breakeven point.
 - (b) Calculate EBIT and earning available for Common.
 - (c) Calculate DOL; explaining its meaning.
 - (d) Calculate DFL; " " "
 - (e) " DTL, " " "
 - (f) If the Company Can sell additional 15 000 units in the next year. Use leverage to predict changes in EBIT and Earnings available for Common.
- Check your work by a simple calculation of EBIT and earnings available for Common, using the basic info. given

" Solution "

$$\begin{array}{llll} Q = 30\,000 & P = \$6 & V_c = \$3.5 & F_c = \$50\,000 \\ I = 13\,000 & PD = 7\,000 & T = 40\% & \end{array}$$

$$\begin{aligned} \text{(a) operating breakeven point} &= \frac{F_c}{P - V_c} = \frac{50\,000}{6 - 3.5} \\ &= \underline{20\,000 \text{ units}} \end{aligned}$$

$$\begin{aligned} \text{(b) EBIT} &= Q(P - V_c) - F_c \\ &= 30\,000(6 - 3.5) - 50\,000 = \underline{\$25\,000} \end{aligned}$$

$$\begin{aligned} \text{Earnings available for Common} &= (EBIT - I)(1 - T) - PD \\ &= (25\,000 - 13\,000)(1 - 40\%) - 7\,000 = \underline{\$2\,000} \end{aligned}$$

(21)

$$(c) \text{ DoL} = \frac{Q(P - V_c)}{Q(P - V_c) - F_c} = \frac{30000(6 - 3.5)}{30000(6 - 3.5) - 50000} = 3$$

for each dollar Δ in sales, EBIT will change by 3 dollars.

$$(d) \text{ DFL} = \frac{\text{EBIT}}{\text{EBIT} - I - \left(\frac{PD}{1-T}\right)} = \frac{25000}{25000 - 13000 - \left(\frac{7000}{1-40\%}\right)} = 75$$

for each dollar Δ in EBIT, Eps will change by 75 dollars.

$$(e) \text{ DTL} = \text{DoL} \times \text{DFL} = 3 \times 75 = 225$$

for each dollar Δ in sales, Eps will change by 225 dollars.

(f) Additional Sales 15000 units

$$\% \Delta \text{ Sales} = \frac{\text{Additional Sales}}{\text{Original Sales}} = \frac{15000}{30000} = 50\%$$

$$\text{DoL} = \frac{\% \Delta \text{ EBIT}}{\% \Delta \text{ Sales}} \quad \% \Delta \text{ EBIT} = \text{DoL} \times \% \Delta \text{ Sales} \\ = 3 \times 50\% = 150\%$$

$$\text{New EBIT} = \text{Old EBIT} (1 + 150\%) \\ = 20000 (1 + 150\%) = \$ 62500$$

$$\text{DTL} = \frac{\% \Delta \text{ Eps}}{\% \Delta \text{ Sales}} \quad \% \Delta \text{ Eps} = \text{DTL} \times \% \Delta \text{ Sales} \\ = 225 \times 50\% = 11250\%$$

$$\text{New earning available for Common} = 200 (1 + 11250\%) = \$ 22700$$

$$\text{EBIT} = Q(P - V_c) - F_c \\ = 45000(6 - 3.5) - 50000 = \$ 62500$$

$$\text{Earning available for Common} = (\text{EBIT} - I)(1 - T) - PD \\ = (62500 - 13000)(1 - 40\%) - 7000 = \$ 22700$$

" Additional Problems "

Problem (17) :

X Company reported earnings available to common stock of \$ 4200000 last year. From those earnings, the company paid a dividend of \$ 1.26 on each of its 1000000 common shares outstanding. The capital structure of the company includes 40% debt, 10% preferred stock, and 50% common stock. It is taxed at a rate of 40%.

- ✓ a- If the market price of the common stock is \$ 40 and dividends are expected to grow at rate of 6% per year for the foreseeable future, what is the company's cost of retained earnings financing?
- ✓ b- If underpricing and flotation costs on new shares of common stock amount to \$ 7 per share, what is the company's cost of new common stock financing?
- c- The company can issue \$ 2 dividend preferred stock for a market price of \$ 25 per share. Flotation costs would amount to \$ 3 per share. What is the cost of preferred stock financing?
- ✓ d- The company can issue \$ 1000 par value, 10% coupon, 5-year bonds that can be sold for \$ 1200 each. Flotation costs would amount to \$ 25 per bond. Use the estimation formula to figure the approximate cost of debt financing.
- e- What is the maximum investment that the company can make in new projects before it must issue new common stock?
- f- What is the WACC for projects with a cost at or below the amount calculated in part e?
- g- What is the WACC for projects with a cost above the amount calculated in part e assuming that debt across all ranges remains at the percentage cost calculated in part d?

Solution

| | |
|---|-------------|
| Earnings available to common | 4 200 000 |
| Dividends paid $(1.26 \times 1000 000)$ | (1 260 000) |
| Retained Earnings | 2 940 000 |

$$D_0 = 1.26 \quad T = 40\% \quad W_D = 40\% \quad W_P = 10\% \quad W_S = 50\% \quad T = 40\%$$

$$(a) \quad P_0 = 40 \quad g = 6\% \quad r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{1.26(1+6\%)}{40} + 6\% = 9.339\%$$

$$(b) \quad \text{flotation} = \$7 \quad r_n = \frac{D_1}{N_n} + g$$

$$= \frac{1.26(1+6\%)}{40-7} + 6\% = 10.047\%$$

(23)

(c) $D_p = \$2$ price \$25 flotation \$3

$$r_p = \frac{D_p}{N_p} = \frac{2}{25-3} = 9.09\%$$

(d) par = \$1000 CR = 10% n = 5 price 1200 flotation 25

$$r_d = \frac{I + \frac{1000 - N_d}{n}}{\frac{N_d + 1000}{2}}$$

$1000 \times 10\% = 100$
 $N_d = 1200 - 25 = 1175$

$$= \frac{100 + \frac{1000 - 1175}{5}}{\frac{1175 + 1000}{2}} = \frac{65}{1087.5} = 5.977\%$$

r_i After Tax Cost of debt = $r_d(1 - T) = 5.977\% (1 - 40\%)$
 $= 3.586\%$

(e) Max Inv before new issue [using Retained Earnings]

$$= \frac{\text{Retained Earnings}}{W_i} = \frac{2940000}{50\%} = 5880000$$

(f) $WACC = W_d r_i + W_p r_p + W_s r_s$
 $= (40\% \times 3.586\%) + (10\% \times 9.09\%) + (50\% \times 9.38\%)$
 $= 7.0129\%$

(g) $WACC_2 = W_d r_i + W_p r_p + W_s r_n$
 $= (40\% \times 3.586\%) + (10\% \times 9.09\%) + (50\% \times 10.047\%)$
 $= 7.3669\%$

* معكم بدل المطلوب e , f , g يطبق حساب {Marginal} WACC لو عندى مشروع
تكاليفه المبدئية 7 مليون

(24)

Problem 18 DuPree Coffee Roasters, Inc., wishes to expand and modernize its facilities. The installed cost of a proposed computer-controlled automatic-feed roaster will be \$130,000. The firm has a chance to sell its 4-year-old roaster for \$35,000. The existing roaster originally cost \$60,000 and was being depreciated using MACRS and a 7-year recovery period. DuPree is subject to a 40% tax rate.

- What is the *book value* of the existing roaster?
- Calculate the after-tax proceeds of the sale of the existing roaster.
- Calculate the *change in net working capital* using the following data:

Anticipated Changes in Current Assets and Current Liabilities:

Accruals -\$20,000, Inventory +50,000, Accounts payable +40,000, Accounts receivable +70,000, Cash 0, Notes payable +15,000

- Calculate the *initial investment* associated with the proposed new roaster

Solution (18)

- Book value = $60000 - (\$60,000 \times 0.69) = \$18,600$
- Recapture of depreciation = Sales price of old equipment - Book value of old equipment
= $\$35,000 - 18,600 = \$16,400$
Taxes on recapture of depreciation = $\$16,400 \times 0.40 = \$6,560$
After-tax proceeds from sale of old roaster = $\$35,000 - 6560 = \$28,440$
- Changes in current assets = Inventory \$50,000 + Accounts receivable 70,000 = \$120,000
Changes in current liabilities = Accruals (20,000) + Accounts payable 40,000 + Notes payable 15,000 = \$35,000
Change in net working capital = $120000 - 35000 = \$85,000$
- Cost of new roaster = $\$130,000 + 85000 - 28440 = \$186,560$

Problem 19

mutually Exclusive projects E, F, and G. The firm's cost of capital is 15% and risk-free rate is 10%. The firm has gathered the following data:

| | Project (E) | Project (F) | Project (G) |
|------------|-------------|-------------|-------------|
| Cost | 5000 | 6000 | 12000 |
| Year | | | |
| 1- | 0 | 6000 | 4000 |
| 2- | 6000 | 4000 | 6000 |
| 3- | 6000 | 5000 | 8000 |
| 4- | 6000 | 2000 | 12000 |
| Risk index | 1-8 | 1 | .6 |

- Ignoring risk differences, which is the preferred project?
- Which project is preferred using RADR?

(25)

Solution (19)

a. project E :

$$NPV = \left[\frac{6000}{(1.15)^1} + \frac{6000}{(1.15)^2} + \frac{5000}{(1.15)^3} + \frac{6000}{(1.15)^4} \right] - 15000$$
$$= 17130 - 15000 = \$ 2130$$

project F :

$$NPV = \left[\frac{6000}{(1.15)^1} + \frac{4000}{(1.15)^2} + \frac{3000}{(1.15)^3} + \frac{2000}{(1.15)^4} \right] - 11000$$
$$= 12678 - 11000 = \$ 1678$$

project G :

$$NPV = \left[\frac{4000}{(1.15)^1} + \frac{3000}{(1.15)^2} + \frac{2000}{(1.15)^3} + \frac{1000}{(1.15)^4} \right] - 19000$$
$$= 20144 - 19000 = \$ 1144$$

→ project E has the highest NPV is preferred

b. project

$$RADR = R_F + \beta (R_M - R_F)$$
$$= 10\% + 1.8 (15\% - 10\%) = 19\%$$

$$NPV = \left[\frac{6000}{(1.19)^1} + \frac{6000}{(1.19)^2} + \frac{6000}{(1.19)^3} + \frac{6000}{(1.19)^4} \right] - 15000$$
$$= 10834 - 15000 = \$ -4166$$

project F :

$$RADR = 10\% + 1 (15\% - 10\%) = 15\%$$
$$NPV = \$ 1678$$

project G :

$$RADR = 10\% + .6 (15\% - 10\%) = 13\%$$
$$NPV \text{ at } 13\% = 2138 - 19000 = \$ -16862$$

→ project G is preferred in case of using RADR

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